

## CLAIMS

1. A data transfer apparatus that receives data from an adjacent upstream data transfer apparatus and transfers the received data to an adjacent downstream data transfer

5 apparatus, comprising:

a data reception device that receives packets that comply to dissimilar communication protocols from the upstream data transfer apparatus;

a content data extraction device that extracts content data included in a packet received by the data reception device;

10 a line selection information storage device in which line selection information for selecting one of communication lines that comply with dissimilar communication protocols is stored;

a line selection device that selects a communication line corresponding to the content data extracted by the content data extraction device based on the line selection information stored in the line selection information storage device; and

15 a data transfer device that transfers the packet to the downstream data transfer apparatus that is connected to the communication line that has been selected by the line selection device.

20 2. A data transfer apparatus that receives data from an adjacent upstream data transfer apparatus and transfers the received data to an adjacent downstream data transfer apparatus, comprising:

a data reception device that receives packets that comply to dissimilar communication protocols from the upstream data transfer apparatus;

a destination information extraction device that extracts destination information that represents a destination included in a packet that has been received by the data reception device;

5 a destination selection information storage device that stores destination selection information for selecting a communication line;

a destination line selection device that selects a communication line corresponding to the destination information that has been extracted by the destination information extraction device based on the destination selection information that is stored in the destination information storage device;

10 a content data extraction device that extracts content data included in a packet received by the data reception device when a plurality of communication lines have been selected by the destination line selection device;

a line selection information storage device that stores line selection information for selecting one of the communication lines that comply with dissimilar communication protocols;

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a line selection device that selects the communication line that has been selected by the destination line selection device or selects a communication line corresponding to the content data extracted by the content data extraction device based on the line selection information stored in the line selection information storage device; and

20 a data transfer apparatus that transfers the packet to the downstream data transfer apparatus connected to the communication line that has been selected by the line selection device.

3. A data transfer apparatus according to claim 2, further comprising:

a packet analyzing device that analyzes the packet received by the data reception device when the destination information extracted by the destination information extraction device represents its own address; and

5 a line selection information updating device that updates the line selection information stored in the line selection information storage device based on information that has been analyzed by the packet analyzing device.

4. A data transfer apparatus according to claim 1, further comprising:

10 a line selection information input device that inputs the line selection information; and wherein:  
the line selection information storage device stores the line selection information input from the line selection information input device.

5. A data transfer apparatus according to claim 2, further comprising:

15 a line selection information input device that inputs the line selection information; and wherein:  
the line selection information storage device stores the line selection information input from the line selection information input device.

20 6. A data transfer apparatus according to claim 3, further comprising:

a line selection information input device that inputs the line selection information; and wherein:  
the line selection information storage device stores the line selection information input from the line selection information input device.

7. A data transfer apparatus according to claim 1, wherein:

the content data includes virtual private network information that represents a virtual private network.

5 8. A data transfer apparatus according to claim 2, wherein:

the content data includes virtual private network information that represents a virtual private network.

9. A data transfer apparatus according to claim 3, wherein:

10 the content data includes virtual private network information that represents a virtual private network.

10. A data transfer apparatus according to claim 4, wherein:

the content data includes virtual private network information that represents a  
15 virtual private network.

11. A data transfer apparatus according to claim 5, wherein:

the content data includes virtual private network information that represents a virtual private network.

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12. A data transfer apparatus according to claim 6, wherein:

the content data includes virtual private network information that represents a virtual private network.

25 13. A data transfer apparatus according to claim 1, wherein:

the content data includes logical line information that represents a logical line.

14. A data transfer apparatus according to claim 2, wherein:

the content data includes logical line information that represents a logical line.

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15. A data transfer apparatus according to claim 3, wherein:

the content data includes logical line information that represents a logical line.

16. A data transfer apparatus according to claim 4, wherein:

10 the content data includes logical line information that represents a logical line.

17. A data transfer apparatus according to claim 5, wherein:

the content data includes logical line information that represents a logical line.

15 18. A data transfer apparatus according to claim 6, wherein:

the content data includes logical line information that represents a logical line.

19. A data transfer apparatus according to claim 7, wherein:

the content data includes logical line information that represents a logical line.

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20. A data transfer apparatus according to claim 8, wherein:

the content data includes logical line information that represents a logical line.

21. A data transfer apparatus according to claim 9, wherein:

25 the content data includes logical line information that represents a logical line.

22. A data transfer apparatus according to claim 10, wherein:

the content data includes logical line information that represents a logical line.

5 23. A data transfer apparatus according to claim 11, wherein:

the content data includes logical line information that represents a logical line.

24. A data transfer apparatus according to claim 12, wherein:

the content data includes logical line information that represents a logical line.

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25. A data transfer apparatus according to any one of claims 7 through 12, wherein:

the virtual private network information includes a VLAN identifier stipulated in IEEE 802.1Q.

15 26. A data transfer apparatus according to any one of claims 7 through 12, wherein:

the virtual private network information includes a VPN label that represents a VPN stipulated in RFC 2547.

27. A data transfer apparatus according to any one of claims 7 through 12, wherein:

20 the virtual private network information includes a VC label that represents a virtual circuit affixed to a protocol data unit.

28. A data transfer system, wherein:

a data transfer apparatus according to any of claims 1 through 24 transfers data to another data transfer apparatus according to any of claims 1 through 24 according to a relay method.

- 5 29. An edge router apparatus that is disposed at a connection between a network and the outside of the network, receives a packet from the outside of the network and transfers the packet to a router apparatus within the network, or transmits a packet from a router within the network to the outside of the network, comprising:

a switching information calculation device that obtains switching information  
10 for switching the received packet at each router apparatus positioned along a transfer path of the received packet within the network based on a destination address of the packet received from the outside of the network; and

a transmitting device that affixes to the received packet the switching  
information obtained by the switching information calculation device in a transfer path  
15 order, and transmits the received packet to which the switching information has been affixed to a transfer destination router apparatus.

30. An edge router apparatus that is disposed at a connection between a network and another network, receives a packet from the other network and transfers the packet to a  
20 router apparatus within the network, or transmits a packet from a router apparatus within the network to the other network, comprising:

a routing table that stores switching information for switching the packet at each  
router apparatus positioned along a transfer path of the packet in the network up to the  
other network for each network address of the other network;

a switching information calculation device that uses a destination address of the packet received from the other network, searches the routing table, and obtains the switching information for switching the received packet at each router apparatus positioned along the transfer path of the received packet within the network; and

5 a transmitting device that affixes to the received packet the switching information obtained by the switching information calculation device in a transfer path order, and transfers the received packet to which the switching information has been affixed to a transfer destination router apparatus.

10 31. An edge router apparatus according to claim 30, comprising:

a data input apparatus for setting the switching information in the routing table.

32. A core router apparatus that receives and transfers a packet to which switching information has been affixed for switching the packet, wherein:

15 the core router apparatus switches the received packet by the core router apparatus itself based on the switching information affixed to the received packet, and the core router apparatus comprises a transmitting device that transmits a packet that has had the switching information used by the core router apparatus itself deleted.

20 33. A network system comprising:

an edge router apparatus that is disposed at a connection between a network and the outside of the network, receives a packet from the outside of the network and transfers the packet to a router apparatus within the network, or transmits a packet from a router within the network to the outside of the network; and



a core router apparatus that receives and transfers a packet to which switching information has been affixed for switching the packet; wherein:

the edge router apparatus comprises:

a switching information calculation device that obtains the switching  
 5 information for switching the received packet at each router apparatus positioned along a transfer path of the received packet within the network based on a destination address of the packet received from the outside of the network; and

a first transmitting device that affixes to the received packet the switching  
 information obtained by the switching information calculation device in a transfer path  
 10 order, and transfers the received packet to which the switching information has been affixed to a transfer destination router apparatus; and

the core router apparatus comprises:

a second transmitting device that switches the received packet in the core router  
 apparatus itself based on the switching information that has been affixed to the received  
 15 packet, and transmits a packet that has had the switching information used by the core router apparatus itself deleted.

34. A network system comprising:

an edge router apparatus that is disposed at a connection between a network and  
 20 an another network, receives a packet from the other network and transfers the packet to a router apparatus within the network, or transmits a packet from a router apparatus within the network to the other network; and

a core router apparatus that receives and transfers a packet to which switching information has been affixed for switching the packet; wherein:

25 the edge router apparatus comprises:

a routing table that stores switching information for switching the packet at each router apparatus positioned along a transfer path of the packet in the network up to the other network for each network address of the other network;

5 a switching information calculation device that uses a destination address of the packet received from the other network, searches the routing table, and obtains the switching information for switching the received packet at each router apparatus positioned along the transfer path of the received packet within the network; and

a first transmitting device that affixes to the received packet the switching information obtained by the switching information calculation device in a transfer path  
10 order, and transfers the received packet to which the switching information has been affixed to a transfer destination router apparatus; and

the core router apparatus comprises:

a second transmitting device that switches the received packet in the core router apparatus itself based on the switching information that has been affixed to the received  
15 packet, and transmits a packet that has had the switching information used by the core router apparatus itself deleted.

35. A network system according to claim 34 wherein:

the edge router apparatus provides a data input apparatus for setting the  
20 switching information in the router table.

36. A network system according to claim 34, wherein:

the edge router apparatus comprises:

a first reporting device that reports a network address of the other network  
25 connected to the edge router apparatus itself and switching information to the other

network to a core router apparatus or another edge router apparatus connected to the edge router apparatus itself as path information; and

a creating device that receives the path information that has been reported from the core router apparatus or the other edge router apparatus connected to the core router apparatus itself, and creates the routing table based on the received path information; and

the core router apparatus comprises:

a second reporting device that affixes switching information for an edge router apparatus or a core router apparatus that have transmitted the path information to the received path information, and reports the path information having affixed the switching information to core router apparatuses and edge router apparatuses other than the edge router apparatus and the core router apparatus that have transmitted the path information among core router apparatuses and edge router apparatuses that are connected to the core router apparatus itself.